

C O P Y

OXC-4147
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November 5, 1962

Dear Mr. Secretary:

In accordance with your instructions, we have completed our acceleration of the work on the 48" ground dynamic model (Hycon Model 302). The model performed successfully on October 15.

During our conference on November 1, concerning the significance of the model performance, you requested that we prepare certain information relative to the characteristics, price, and delivery schedule of flying models built on an accelerated basis.

Exhibit A summarizes performance characteristics as compared with Model 73B. Exhibit B is the best attainable delivery schedule. Exhibit C presents cost information. Exhibit D is an analysis of the value of the design improvements and innovations included in the Model 302.

In meeting either Schedule A or B, Hycon would require priority assistance, particularly in the following areas:

- a. Procurement of optics and optical blanks
- b. Procurement of a limited amount of beryllium
- c. Procurement of gyros
- d. Assignment of machine tools from the government stockpile.

Model 302 is an extension of 73B and therefore has built into it the proven reliability of that system. While Exhibit D summarizes the principal advantages of the 302 equipment, there is one central fact which to us seems dominant. The 33 1/3 percent increase in photographic scale (over Model 73B), coupled with the higher system resolution, means that the 302 has more than twice the ground resolution of the 73B.

We are prepared to embark upon production of this camera system on the most urgent basis.

Sincerely yours,

Enclosures

Honorable Joseph V. Charyk
Under Secretary of the Air Force
Washington 25, D.C.

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EXHIBIT A

Comparative Performance Summary (See Notes)

	<u>Model 73B</u>	<u>Model 302</u>
Ground Resolution (feet)	1.0	.45
Weight, including 6000 ft. film (pounds)	489	550
System Resolution (AWAR)	54	90
2/1 Standard Target		
Lens/Film Resolution (AWAR)	60	110
System Angular Resolution (Seconds of arc)	4.1	1.9
Focal Length (inch)	36	48
Field of View (degrees)	28	21
Aperture (f number)	10	5.6
Format (inches)	18 x 18	18 x 18
Image Motion Compensation (type)	Body moves	Mirror moves
IMC Rate (milliradians/sec)	Fixed 12	Variable 3.9 thru 25
Cycling Rate (sec/cycle)	Fixed 4.5 or 7.5	Variable .8 thru 8
Shutter Type	Intra Lens	Focal Plane
Shutter Speed (second)	1/125 or 1/250	1/60 to 1/1000
Special Shutter Speeds (second)	?	1/1000 to 1/4000
Direction of Film Transport	Opposite direction	Same direction
Scanning Characteristics	Heavy - Slow	Light - Fast

Note 1 - All comparative numbers refer to a standard altitude of 100,000 feet.

Note 2 - The higher speed and larger aperture and other characteristics of Model 302 should permit 0.35 ft. ground resolution at altitudes as low as 80,000 feet.

Note 3 - The 48-inch focal lens increases the photographic scale of the Model 302 33 1/3% over that of the Model 73B.

Note 4 - Lens by Brouwer of Diffraction, Ltd., Boston, Massachusetts

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EXHIBIT C

Hycon Model 302

Delivery Schedule

	<u>Basis A</u>	<u>Basis B</u>
1st Unit	5 months	5 months
2nd Unit	7 months	7 months
3rd Unit	8 months	8 months
Units 4 thru 11	One per month, provided optics become available.	

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Advantages of the Model 302

1. Higher Resolution. The system resolution of the Model 302 will be 65 percent greater than the demonstrated system resolution of the Model 73B. This resolution will be achieved by advances in optical materials and optical design, advances in camera component design such as shutter and DCC mechanism, and by the use of a stabilizer.
2. Reliability. The proven reliability of the 73B system is retained in the Model 302 camera. Most features of the 302 design are based on the concepts of the 73B. Even 302 components not found in the earlier 73B are patterned after proven concepts. For example, the 18x18 inch focal plane shutter was first built over two years ago and is the largest of a family of highly reliable focal plane shutters, all of the same basic design. No less than three cameras featuring rotating mirrors precede the Model 302, and two such cameras handle film loads in excess of 4000 feet.
3. Longer Focal Length. The focal length of the Model 302 lens is one-third longer than that of the Model 73B. Consequently, the 302 results will be at a 33 1/3 percent larger photographic scale. This larger scale coupled with higher resolution means that the 302 will be capable of resolving detail more than twice as fine as the existing 73B.
4. Faster Lens. The Model 302 utilizes a significantly faster lens, f/5.6 as opposed to f/10 for the 73B, and has a focal plane shutter with a speed range wide enough to take advantage of the faster lens. This lens-shutter combination will provide a marked increase in the operational capability of the camera system. For example, as compared with the 73B, the 302 system will be capable of operating at significantly lower light levels. At higher latitudes this will have the effect of extending both the photographic day and photographic year. In addition the same camera will be capable of operation at the much more intense light level conditions of the lower latitudes.
5. Faster Cycle Rate. The Model 302 has a significantly faster cycle rate than the 73B, a fact which will enable it to be used in vehicles having much higher performance.
6. Multiple Image Capability. The higher cycle rate of the Model 302 will provide a multiple image capability when used in a one or two position mode. In a single position mode the 302 will provide a minimum of 12 separate images of the same target. In a two position mode a minimum of 6 separate images will be attainable in the vertical and up to 8 in the high oblique positions.
7. Greater Flexibility. The 302 has a wider operating range in terms of cycle rate and shutter speed and can operate in existing vehicles as well as those of higher performance. In addition, the physical size, weight and volume of the 302 are comparable to that of the 73B. For example, use of a modified hatch will enable it to be used in the existing vehicle in place of the 73B.
8. Stabilized Systems. Unlike the present Model 73B, the 302 will be stabilized during operation so will be independent of the effects of vehicle motion. The stabilizer will be an integral part of the camera and will represent only 5 percent of the total camera system weight as opposed to the more than 50 percent for more conventional stabilized camera systems.
9. Ground Support Equipment. The GSE required for the Model 302, although moderately more complex than that required for the 73B, is nevertheless very similar to the 73B support equipment. The 302 GSE will make maximum use of the experience gained on the 73B and can be readily integrated into existing military capability.

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